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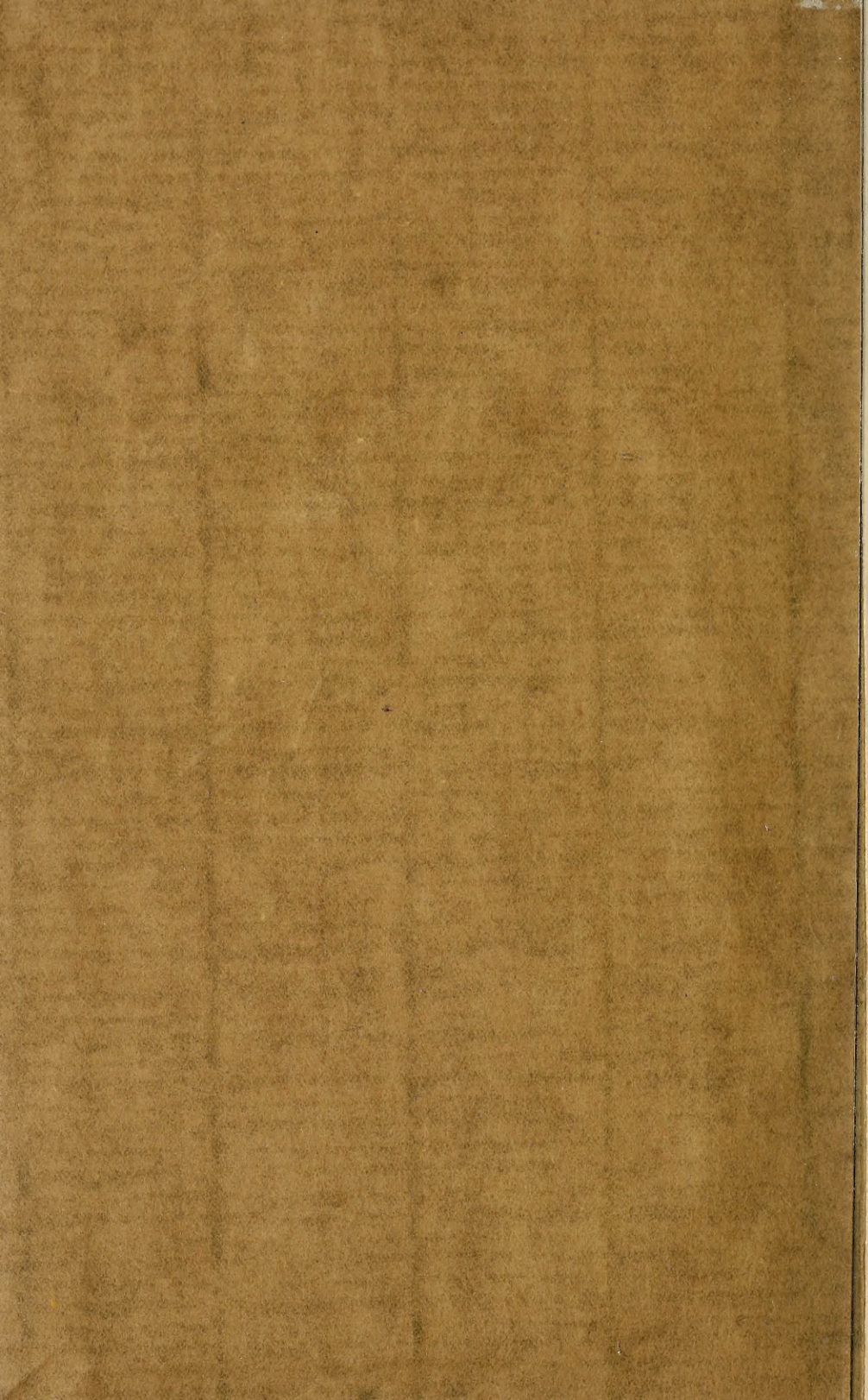
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**NORTH CAROLINA DEPARTMENT OF CONSERVATION
AND DEVELOPMENT**

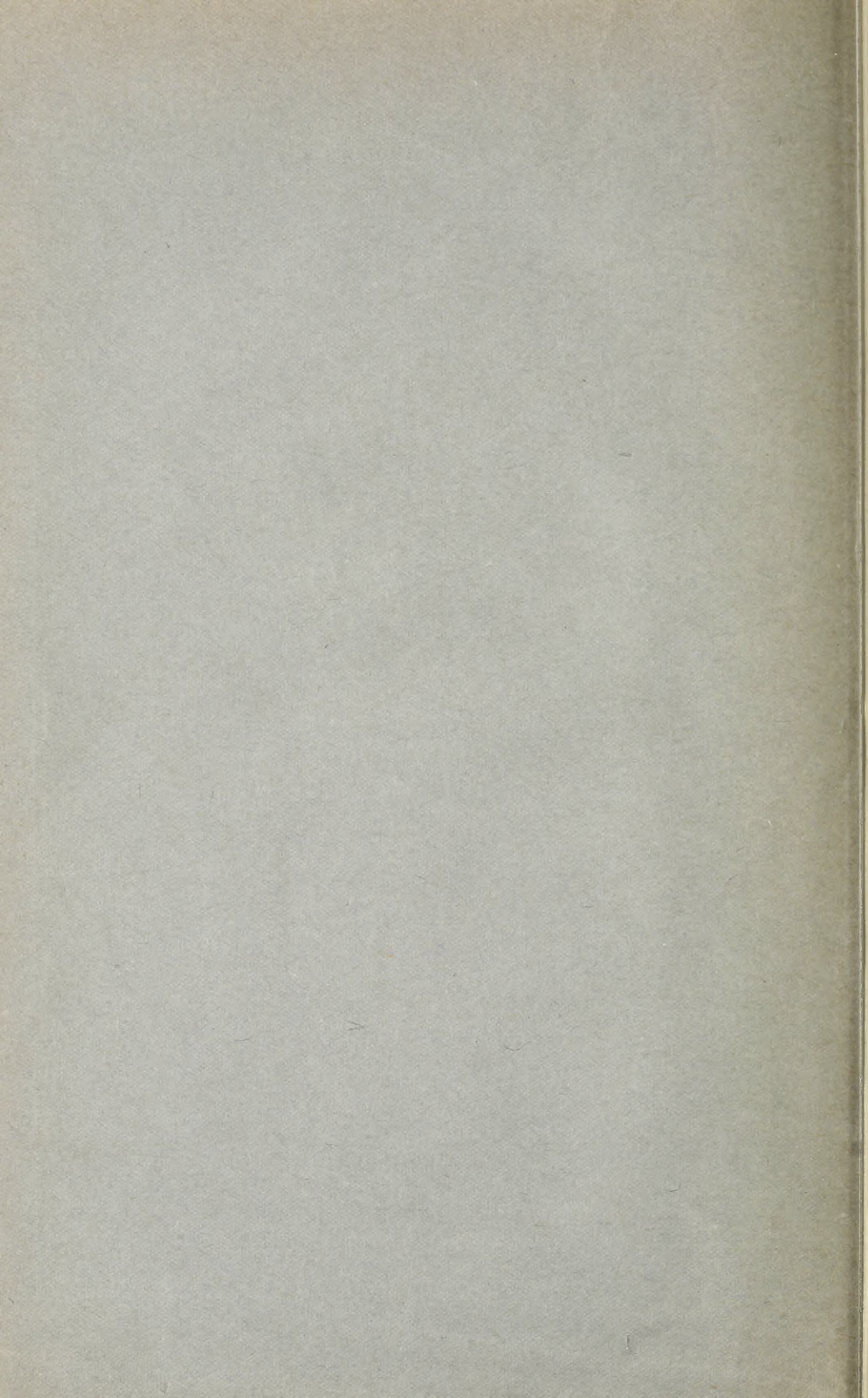
WADE H. PHILLIPS
Director

BIENNIAL REPORT
OF THE
DIRECTOR

1925-1926

July 1, 1924, to June 30, 1926





**NORTH CAROLINA DEPARTMENT OF CONSERVATION
AND DEVELOPMENT**

WADE H. PHILLIPS
Director

BIENNIAL REPORT
OF THE
DIRECTOR

1925-1926

July 1, 1924, to June 30, 1926



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LETTER OF TRANSMITTAL

RALEIGH, N. C., December 22, 1926.

To His Excellency, HON. A. W. McLEAN,
Governor of North Carolina.

SIR:

Complying with Section 11, Chapter 122, Public Laws of 1925, I have by direction of the Board prepared and submit herewith to you for the General Assembly a report showing the nature and progress of the work done by the North Carolina Department of Conservation and Development, together with a statement of expenditures of the Department for the biennium ending June 30, 1926.

Very respectfully submitted,

WADE H. PHILLIPS,
Director.

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MEMBERS OF THE BOARD OF CONSERVATION AND DEVELOPMENT

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WADE H. PHILLIPS, *Director*, Raleigh

OFFICIALS AND EMPLOYEES

ADMINISTRATIVE DIVISION

WADE H. PHILLIPS.....	Director
R. L. GRAY, SR.....	Editor "Natural Resources"
ELIZABETH MONTGOMERY.....	Secretary-Stenographer
ETOYAL PARKER.....	Jr. Accounting Clerk
GLADYS PRITCHETT.....	Stenographer

FORESTRY DIVISION

J. S. HOLMES.....	State Forester
W. C. McCORMICK.....	Asst. State Forester
F. H. CLARIDGE.....	Assistant Forester
GRACE WHITE.....	Sr. Accounting Clerk-Stenographer
ELSIE HOBBY.....	Stenographer

R. G. WHEATON.....	District Forester, Asheville
MRS. DOROTHY GRINNELL.....	Stenographer (part time)

With 732 forest wardens conducting the work in the following eight present coöperating counties:

Buncombe, Haywood, Henderson, Macon, Madison, Polk, Swain, Transylvania.

H. M. SEBRING.....	District Forester, Lenoir
DAISY ARMENTROUT.....	Stenographer (part time)

With 711 forest wardens conducting the work in the following nine present coöperating counties:

Avery, Burke, Caldwell, McDowell, Rutherford, Surry, Watauga, Wilkes, Yancey.

K. E. KIMBALL.....	District Forester, Fayetteville
ELIZABETH BENNETT.....	Stenographer (part time)

With 667 forest wardens conducting the work in the following seven present coöperating counties:

Bladen, Columbus, Cumberland, Duplin, Harnett, Moore, Robeson.

CHAS. H. FLORY.....	District Forester, New Bern
MARY LOUISE WATERS.....	Stenographer (part time)

With 406 forest wardens conducting the work in the following six present coöperating counties:

Beaufort, Craven, Jones, Lenoir, Pitt, Onslow.

WATER RESOURCES DIVISION

THORNDYKE SAVILLE*.....	Hydraulic Engineer (part time)
CHAS. E. RAY, JR.....	Assistant Engineer (part time)
G. WALLACE SMITH.....	Office Engineer (part time)
ELIZA MOORE.....	Stenographer (part time)
L. J. HALL.....	Field Engineer, Asheville
Mrs. EFFIE T. WORKMAN.....	Statistician, Asheville

FIELD SURVEY PARTIES, SUMMER OF 1925

New and Watauga River Surveys—R. M. Trimble, Engineer in charge; F. M. Bell and Chas. E. Ray, Jr., instrumentmen; Arthur Hollett, John Lynch and Bob Hughes, rodmen.

LIST OF GAGE READERS:

Atlantic Drainage

Joseph D. Bynum.....	Route 3, Chapel Hill, N. C.
Chas. R. Cardwell.....	Francisco, N. C.
Henry Carter.....	Pine Hall, N. C.
Melvin Clark.....	Route 1, Rougemont, N. C.
Willis S. Davis.....	Route 1, High Point, N. C.
Marvin Ellis.....	Route 1, Bahama, N. C.
Leo Kelly.....	Lillington, N. C.
Miss Ada Kidd.....	Dobson, N. C.
J. S. Lewis.....	Taylor's Mill, Zebulon, N. C.
V. B. Mangum.....	Route 1, Bahama, N. C.
Thomas Pace.....	Route 2, Box 56, Zebulon, N. C.
S. U. Reynolds.....	431 Main St., N. Wilkesboro, N. C.
Willie H. Slate.....	Francisco, N. C.
J. M. Wall.....	Nebo, N. C.
J. N. Woodell.....	Box 24, Ramseur, N. C.

*On leave of absence with Venezuelan government July 1, 1926 to September 1, 1927, leaving Assistant Engineer in charge of Division.

Ohio Drainage

James Early.....	51 Edwards St., Swannanoa, N. C.
W. E. Field.....	Horseshoe, N. C.
H. H. Lemley.....	Fleetwood, N. C.
Mrs. Henry Miller.....	Warrensville, N. C.
Geo. W. Sheets.....	Waggoner, N. C.
C. W. Robinson.....	Route 1, Chandler, N. C.
S. K. Woody.....	Pisgah Forest, N. C.

*Tennessee River Drainage**

T. E. Breedlove.....	Etna, N. C.
W. M. Brown.....	60 Ora St., Asheville, N. C.
J. L. Clark.....	Cullasaja, N. C.
J. H. Coffey.....	Almond, N. C.
Mrs. Catherine Coxe.....	Spruce Pine, N. C.
A. H. Gillespie.....	Caivert, N. C.
J. T. Hayes.....	Tomotla, N. C.
A. D. Kilpatrick.....	Ranger, N. C.
Miss Mary Kinsland.....	Clyde, N. C.
Miss Willie Mingus.....	Murphy, N. C.
Mrs. A. B. Osborne.....	Blantyre, N. C.
Mrs. U. G. Reeves.....	Brevard, N. C.
L. W. Roberson.....	776 Montford Ave., Asheville, N. C.
J. L. Walters.....	Cherokee, N. C.
W. D. Wike.....	Cullowhee, N. C.
Mrs. S. P. Williamson.....	Horseshoe, N. C.

*Observers' salaries being carried by U. S. Army Engineers at present.

GEOLOGICAL DIVISION

J. L. STUCKEY.....	State Geologist
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INTRODUCTION

This Department was created by the General Assembly of 1925 (Public Laws of 1925, Chapter 122). A part of the new Department's function was to take over the work heretofore done by the Geological and Economic Survey. In Addition, the Department of Conservation and Development was given broader powers in regard to the conservation and development of the State's resources. The new act emphasizes as much as ever the importance of forestry, water resources and geology. It is also provided that the Department shall be a publicity bureau to advertise the State. It is required to gather and collate fundamental facts on the State's industrial and natural resources, to collect and publish from time to time statistics showing the growth of the State and its economic advantages.

ADMINISTRATIVE DIVISION

On September 1, 1924, Director Brent S. Drane moved the headquarters of the Department from Chapel Hill to Raleigh. Thus the work of the Department has been facilitated by closer contact with the other departments and State agencies.

On April 4, 1925, Director Drane was succeeded by Wm. D. Harris, Acting Director, who was followed by Acting Director J. L. Stuekey on 15th day of August, 1925. The present Director took charge of the Department December 20, 1925.

Coöperation—As contemplated by the new law, other State departments and State agencies have heartily supported the efforts of the Department. They have furnished facts and statistics bearing on the State's resources. They have shown a fine spirit of coöperation in all the work of the Department. Chambers of Commerce, civic and trade associations have likewise given splendid assistance in furthering the Department's program. The public at large has shown keen interest in the operation of the various services of the Department. Many counties and individuals have rendered financial coöperative aid in the forestry work. The Federal government has generously coöperated in both forestry and geology. The U. S. Department of Commerce has given assistance in getting important data on our industries. The members of the Board of this Department have given unstintingly of their time and advice. Their coöperation has been most helpful.

Publicity—The publication of "Natural Resources," a bi-monthly periodical of the Department, has met with considerable success. It has a circulation of about 3,000 and deals entirely with the problems of conserving and developing the State's resources. The Publicity Director, R. L. Gray, has also furnished news items constantly to the press of the State, these items bearing on the Department's work.

State Advertising—In addition to the Department publicity, definite attempts have been made to advertise the State in other ways. Articles dealing with the State's growth and advantages have been furnished various national periodicals. Important facts about the State have been sent to investment bankers and to business and financial journals. Director Drane's pamphlet, "Facts and Figures," has been in much demand and has a wide circulation. Through the efforts of the present chairman of the board, the *National Geographic Magazine* for May,

1926, carried an excellent article on North Carolina, splendidly illustrated. *The Review of Reviews*, *World's Work*, *Manufacturers Record*, *Investors' Magazine*, *New York Sun*, *New York Times* and other publications have carried articles on North Carolina's progress, facts for which in part were gathered by the Department. On November 6, 1926, *The Christian Science Monitor* carried an 18-page supplement on North Carolina which edition was circulated all over the world. The Department actively assisted in collecting the material and pictures for this edition.

The publishing of the Department booklet "North Carolina, the Fifth State" turned out to be an effective bit of advertising. The State press, leading business and professional men unanimously endorsed it. No other state, so far as we know, has attempted to publish anything quite like this booklet. With only 30,000 copies a proper distribution presented some difficulty. On November 1, 1926, copies had been distributed as follows:

<i>Distributed</i>	<i>No. Copies Printed</i>
Members of Board.....	72
State Officers	250
N. C. Newspapers	230
N. C. Societies in U. S.....	35
Members of Legislature.....	200
Clerks of Court.....	100
Superior Court Judges.....	22
Solicitors	22
Merchants and other Associations.....	150
Women's Clubs and Organizations.....	289
Presidents of Cotton Mills.....	517
Presidents of Banks.....	595
Civic Clubs.....	140
County School Superintendents.....	100
High School Superintendents.....	200
School Teachers.....	400
Sesqui-centennial Exposition.....	600
Other Expositions	100
Selected mailing list.....	2,300
Individuals by request.....	5,482
Chambers of Commerce.....	8,000
By the Governor.....	406
Postmasters	50
<hr/>	
Total	20,260
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Balance on hand.....	9,740

The proposal by Governor McLean for a State-owned radio broadcasting station has been heartily endorsed by the Board for this Department and it is hoped ways and means may be found for the erection of such station at an early date.

Fairs and Exhibitions—The Department in the last two years has placed an exhibit of the State's resources at several fairs, including Made-in-Carolinas Exposition at Charlotte, the Southern Exposition at New York, the Eastern Carolina Fair, the State Fair and others. The Department took the lead in having the State represented at the Sesqui-centennial Exposition by a publicity booth. Other departments whose exhibits and financial aid made possible this project are: State Highway Commission, Department of Agriculture, Health Department, Department of Education and Historical Commission. The booth was visited by many thousands who were induced to learn of the State from the maps, charts and pictures on display. Each department furnished for distribution attractive literature showing the progress of North Carolina. The exhibit was highly esteemed by those who studied it.

As a recognition of its merit a silver medal was awarded the State of North Carolina on this exhibit by the Sesqui Jury of Awards.

In addition to the foregoing, the Department has answered thousands of inquiries about the State, coming from practically every state in the Union.

Surveys—Early in 1926, the Department conducted two State-wide surveys. One to ascertain the production and demand for native building material, and the other to determine the extent, the kind and cost of building construction in the State. The results of both were published and statistical data furnished the trade associations concerned. Plans are being perfected for a State-wide survey of the State's resources. There is a provision in the next budget for a trained statistician to assist in the work. An authoritative survey of the State's economic advantages would be a step in keeping with our present progress. The information gained would help the work of forestry, geology and water resources, but especially such a survey will fill a vital need as a foundation for State advertising.

Statistical Work—The Department is called on almost daily for statistical data pertaining to the State. State publications contain much useful data, but classification and compilation is needed. The Department collected and classified a number of tables mostly in demand, mimeographed them and made distribution to Chambers of Commerce and others concerned.

Offices—Owing to the location of the old building on McDowell Street and the fact it was never intended for offices, the Director was able to obtain from the Committee on Buildings and Grounds permission to occupy the fifth floor of the former Revenue Building in rear of Agricultural Building. The Administrative and Publicity Divisions moved into these new quarters about September 1, 1926. It is planned to have the State Geologist also in these new quarters. Later, if the Board of Health can find fire-proof space elsewhere for their records, now filling two rooms, the Forestry Division can also move in, releasing our old quarters for other uses.

The disbursements under this Division have been as follows:

ADMINISTRATIVE

Disbursements for Biennial Period Ending June 30, 1926

Director's salary	\$11,216.66
Personal services—professional and clerical.....	16,514.45
Supplies and materials.....	840.11
Postage, telephone and express.....	4,054.28
Travel expenses	2,797.54
Printing—forms, blue prints, photographs.....	192.32
Lights	87.86
Repairs to building and equipment.....	414.63
Equipment	536.28
Rewards	15.00
Miscellaneous	3,218.34
	<hr/>
	\$39,887.47

STATE FOREST SERVICE

Two-thirds of the total area of this State is still classed as forest land, it being occupied to a greater or less extent with growing trees. During the past 15 or 20 years the forest area has been encroached upon for agriculture scarcely at all except in a few localities such as the peach region of the sandhills. The tendency has all been towards more intensive use of the land already cleared rather than extending farm operations to new lands. In other words our forest area has become stabilized and we have come to recognize that its chief value is for producing timber, regulating stream flow or other forest uses.

The job of putting every acre of this vast area to producing at its highest capacity whether supplying timber for our important and varied industries, protecting the streams which supply our cities with water and our mills with power or retaining the attractive scenic or recreational features which draw our thousands of visitors, is one for joint action by the landowners and the public. The public, represented by this Department, has recognized its obligation to take the lead, and coöperation from the landowners is being received, but even yet the importance of the work is only just coming to be recognized.

Although the home of the Geological and Economic Survey was moved from Chapel Hill to Raleigh on September 1, 1924 and the name of the organization changed to the Department of Conservation and Development by the General Assembly of 1925, the scope of the activities of the Forestry Division has been little changed, the chief difference being that legal recognition was given to projects which previously had been more or less experimental such as the close relations of our lakes, streams and forests in their uses for recreation, scenery, and production of wild life.

Because of the expansion of forestry in other states there has been a big demand for well trained and experienced technical men, and the Forestry Division has suffered serious losses through resignations. Mr. Harry Lee Baker, who took charge of the forest protection work only two weeks before the beginning of this biennial period resigned after fourteen months of valuable constructive service. The Department has been fortunate in securing as his successor, Mr. W. C. McCormick, a man of thorough training and wide experience in this work. Of the three District Foresters Messrs. C. I. Peterson, Fred B. Merrill and K. E. Kimball, only the last remains. Mr. Peterson is now in charge

of the forest fire prevention work of Tennessee and Mr. Merrill is State Forester of Kentucky. Mr. Thos. W. Alexander who succeeded Peterson later resigned for a more lucrative position. The present force, increased by one District Forester is working faithfully, with undivided interest in the work and for the well-being of the State. No reference to the personnel of this Division should be made without commending the efficiency, thoroughness and devotion of Miss Grace White whose supervision of the detailed field expenditures connected with forest fire prevention has saved the State Forest Service much time and money.

FOREST PROTECTION

That forest fires are the greatest enemy of North Carolina's timber resources has never been denied. Virtually all timberland owners within the State realize this fact. Many such owners have attempted to keep fire from their lands by individual efforts for many years. Such efforts, however, were of little avail due to lack of coöperation from others and absence of police authority vested in such men to enforce the forest laws and summons help to assist them in combatting fires.

Realizing that this work must assume State-wide proportions to accomplish the desired end and that a trained personnel must be maintained under the direction of one general head, the State Forester began forming the present Forest Fire Prevention and Suppression organization in 1915 with the small amount of funds made available by the State and Federal government for carrying on this work. Wardens were first appointed with authority to enforce the State Forest laws and handle all fires occurring within their designated districts. These part-time men, paid only for actual time spent in fire work, were, necessarily, very few in number. As increased appropriations were made from year to year, additional wardens were appointed and trained foresters were gradually added to the organization as full-time employees to devote their entire time to completing the organization and supervising the field work.

From this small beginning has grown the present organization consisting, on June 30, 1926, of five trained foresters who devote their entire time to this work, each having specialized in forest fire prevention work through several years practical experience. These regularly employed foresters direct the work in the field of the 2,500 part-time resident forest wardens now under formal appointment in the coöperating counties in conducting an intensive campaign against the spread of forest fires within the State.

Through the use of moving pictures, illustrated lectures, talks before schools, civic clubs, at picnics and wherever the thought can best be driven home, this message of forest fire prevention is being carried. Fire warning posters are placed before the reading public. Pamphlets are written and distributed. Exhibits are arranged at county fairs. News stories are furnished the newspapers and the Associated Press is supplied with items for general circulation. No opportunity is missed of placing before the residents of the State the fact that forest fires must be controlled or the State will face a timber famine within the

very near future. There are daily indications that the Department through the work being carried on by its organization in the field, has caused a general awakening to the great danger confronting the State from this "red demon."

The following chart graphically shows the progress that has been made during the past five-year period:

PROGRESS CHART

Personnel:	July 1 1922	July 1 1923	July 1 1924	July 1 1925	July 1 1926
District Foresters.....	2	2	3	4	4
County Wardens.....	0	12	25	20	33
District Wardens.....	145	212	231	261	364
Deputy Wardens.....	0	18	1,100	1,530	2,119
Total Number Wardens.....	145	422	1,356	1,811	2,516
Organization:					
Cooperative Counties Calendar Year...	24	2	28	30	30
Cooperative Private Timberland Owners.....	0	0	0	5	21
Timberlands Under Protection.....	3,872,100	7,180,900	8,007,700	8,243,700	8,800,600
Appropriated by Counties.....	4,000	7,200	9,827	11,495	14,600
Appropriated by other Cooperatives.....	0	0	0	500	2,410
Appropriated by State.....	8,000	19,000	18,682	17,470	16,990
Appropriated by Federal Government.....	12,000	21,500	19,875	29,465	34,000
Total Appropriation.....	24,000	47,700	48,384	58,930	68,000

County Coöperation—Counties first began coöperating with the State in fire prevention work in the fall of 1921. Four counties—Avery, Buncombe, Jackson and New Hanover, with a total appropriation of \$1,500 were the first to avail themselves of this opportunity.


The following table shows the counties coöperating with the State during the five-year period from 1922 to 1926, inclusive. For comparison is shown the amounts appropriated yearly during this period.

County	1922	1923	1924	1925	1926
	Amount	Amount	Amount	Amount	Amount
1 Avery	\$ 150	\$ 150	\$ 150	\$ 300	\$ 300
2 Beaufort.....	250	250	250	250	250
3 Buncombe.....	1,000	1,000	1,000	1,000	1,000
4 Burke.....		100	100	200	300
5 Bladen.....					500
6 Caldwell.....		200	200	450	450
7 Cherokee.....	100	150	150		
8 Clay.....	200	125	250		
9 Columbus.....	150	200	200	500*	500
10 Craven.....		750	750	650	650
11 Cumberland.....	300	300	300	300	300
12 Duplin.....				500	2,500
13 Haywood.....	250	300	300	400	400
14 Harnett.....		300	300	500	500
15 Henderson.....		200	200	200	200
16 Jackson.....	200				
17 Jones.....				400	400
18 Lenoir.....				500	500
19 Macon.....				500	500
20 Madison.....		400	400	400	400
21 McDowell.....	300	400	400	650	500
22 Mitchell.....			300	300	300
23 Moore.....				500	500
24 New Hanover.....	200	150	150	500	
25 Onslow.....					500
26 Pamlico.....	200	200	200		
27 Pender.....		400	400		
28 Pitt.....				500	500
29 Polk.....		150	200	200	200
30 Robeson.....		800	800	800	800
31 Rutherford.....			600	600	600
32 Sampson.....		200	200	200	
33 Surry.....					500
34 Swain.....		300	300	300	300
35 Transylvania.....	300	300	300	300	300
36 Watauga.....	250			100	100
37 Wilkes.....	500	500	500	500	500
38 Yancey.....			300	300	300

*Coop. Suspended part of time.

The following table covers the forest fire statistics with the State for the seventeen-year period from 1909 to 1925, inclusive.

TABLE IV
FIRE STATISTICS, ENTIRE STATE OF NORTH CAROLINA, CALENDAR
YEARS 1909 TO 1925

Year	Number Fires Reported	Area Burned, in Acres	 Damage in Dollars	Size of Average Fire in Acres	Average Damage per Fire in Dollars	Average Damage per Acre in Dollars
1909.....	607	406,065	\$ 252,404	667	\$ 439	\$.66
1910.....	706	579,553	526,990	821	775	.97
1911.....	637	160,225	448,700	250	705	2.80
1912.....	665	616,051	1,089,784	926	1,639	1.76
1913.....	551	323,444	706,209	587	1,282	2.18
1914.....	669	295,000	600,000	462	939	2.03
1915.....	1,151	412,000	495,000	303	445	1.30
1916.....	2,212	977,000	3,640,000	442	1,646	3.60
1917.....	1,833	128,000	673,000	68	367	5.18
1918.....	1,136	204,000	856,000	180	753	4.20
1919.....	1,359	253,000	1,255,000	181	923	4.56
1920.....	1,607	190,000	1,258,000	119	783	6.63
1921.....	1,632	271,430	1,093,000	166	666	4.01
1922.....	1,227	180,737	639,000	147	521	3.54
1923.....	1,308	269,000	820,000	206	627	3.04
1924.....	2,575	320,508	1,418,957	125	551	4.43
1925.....	2,684	497,712	1,947,509	185	726	3.89
Totals.....	22,559	6,083,725	\$ 17,719,553	-----	-----	-----
Averages.....	1,327	357,866	\$ 1,042,309	270	\$ 785	\$ 2.91

The forest fire statistics for the years 1909 to 1920, inclusive, were compiled from reports made at the end of each year by voluntary correspondents. As additional counties begin coöperation and the warden force is increased these fire statistics will become more reliable. With the continued growth of the organization more fires will necessarily be reported due to the fact that more fires are handled by the wardens. Nineteen twenty-five and twenty-six were exceptionally dry, assisting in the increase shown for these two years. Although the yearly number of fires for these years appears to be increasing, the acreage burned is being reduced annually and damage figures lowered.

The entire organization is striving to reduce the acreage burned per fire, thus reducing the damage done. To accomplish this the warden force is being distributed in such a manner that no fire can burn long before being seen or heard of by some warden who will immediately start working on it to hold it to the lowest possible acreage.

Private Coöperation—Private coöperators have increased from five in 1925 to twenty-one in 1926 with an increase in appropriation from \$500 to \$2,410. (See Progress Chart.) Timber landowners are becom-

ing more interested in the work daily and appropriations available with which to match their funds the State could no doubt secure double the present contributions.

Where private holdings are listed with the State on a one cent per acre basis such money is matched by an equal amount of State and Federal funds. This money is used in employing fire fighters and patrolmen, paying wardens' salaries, buying tools and equipment, erecting lookout towers, burning fire lines and in such other necessary expenditures as are made in the actual protection of such holdings from fire. These coöperative areas are given the same supervision by the regularly employed foresters as is the work in the coöperating counties.

One group of landowners in District 3 has organized itself into the Cape Fear Forest Protective Association with a ten dollar membership fee and an annual contribution of one cent per acre to be matched by a similar amount of State and Federal money. Through the effective efforts of District Forester K. E. Kimball and the County Wardens, Mr. J. A. D. McCormick, a 60-foot wooden lookout tower has recently been erected on Cameron Hill in Harnett County in coöperation with certain members of this same group. This is being connected up by telephone with the surrounding country so that quick action can be secured in getting to a fire discovered by the lookout.

Federal Coöperation—The Federal Government made annual appropriations under the Weeks Law up to the enactment of the Clark-McNary Law that became effective July 1, 1925. These appropriations were disbursed by the State Forester along with State and private funds. The amounts made available are shown in the chart on page 18. For fiscal year 1925-26, under the Clark-McNary Law the State received the sum of \$29,465. A maximum allotment of \$34,000 has been promised for the fiscal year 1926-27 on a 50-50 basis.

A larger Clark-McNary appropriation is expected next year and undoubtedly North Carolina will be allotted a material increase over this year if funds are available to match this Clark-McNary money.

To secure the maximum allotment of these Federal funds the State must have an equal or larger sum either as a legislative appropriation or under formal agreement with coöperators. As many new states are coming in under the Clark-McNary Law for a share of this money there is no assurance that the Federal Government will meet North Carolina on a 50-50 basis another year. In fact it is most probable that the proportion of Federal funds will be reduced.

State and Federal funds, together with those appropriated by county and private coöperators are made available for the forest fire preven-

tion work. In addition to the wages of wardens and fire fighters for the prevention and suppression of fires part of this money is expended for the purchase of much-needed equipment, and the warden force is being gradually supplied with the latest and most approved fire fighting tools.

A system of lookout towers is also needed and one such tower was constructed in Harnett County, through the coöperation of landowners.

Law Enforcement—While the main endeavor is toward educating the public against the spread of forest fires, it oftentimes becomes necessary to prosecute violations of the State forest fire laws. All wardens under appointment can make arrests following any violation of these laws and County and District wardens are instructed to conduct such prosecutions.

Through the efforts of Hon. Welch Galloway of Transylvania and other interested members of the General Assembly of 1925 the forest fire law was helpfully amended in several particulars. Two methods are employed in enforcing the laws: Every fire is investigated immediately following such fire, and the responsibility for its origin is placed. If incendiarism, wilful neglect or carelessness are responsible, a warrant is sworn out and a prosecution immediately conducted.

If it is found that the fire spread accidentally and the party responsible for such spread admits his guilt and made an effort to assist the wardens in its suppression, the party is asked for the costs incurred by the Department in controlling such fire, and if this request is complied with no further action is taken. If such party refuses to pay such suppression costs, the usual prosecution is carried out and a judge allowed to decide the guilt of the party so involved.

Public sentiment appears strongly back of prosecution. During the first six months of 1926 seventy-three prosecutions were conducted with fifty-six convictions, while \$900 was collected in fines and costs. During this same period seventy-two cases were settled out of court and \$975 in suppression costs was paid into the Department. When costs of suppression are paid in they are credited to the county in which the costs were incurred, thus allowing the use again of such funds within that county. Plans for the future contemplate, among other things, the early establishment of another protective district, to include the northeastern counties between District 4, and the Virginia line. In coöperation with this Department and the Virginia forestry officials the landowners of the Dismal Swamp region on both sides the State line are proposing a protective association. This may be taken care of by the association itself during the next year and until increased

State appropriations shall enable the North Carolina Forest Service to do its share. This region has long needed such service so it is hoped these plans can be carried out.

Forest Planting—While it is recognized that the prevention of forest fires will in most cases be sufficient to secure a second crop of timber after cutting, there are many areas in all parts of the State which have already been so seriously injured by lumbering, fire, and livestock that only by actual planting can reforestation be secured. Forest planting should be recommended on the four million or more acres of devastated pine lands in eastern Carolina, on the impoverished and eroded farm lands in the Piedmont and mountain section and on city watersheds where the control of the streams is essential.

Raleigh Nursery—Following a request by the State College of Agriculture and Engineering that the State Forester assist them in establishing a course in forestry and an offer by the U. S. Forest Service to contribute as much as \$2,000 annually on a 50-50 basis for the growing and distribution of forest tree seedlings to farmers under the Clark-McNary law, an agreement was entered into with the College under which an assistant forester would be employed by this Department to give half his time to teaching elementary forestry and the other half to the establishment of a forest nursery. Mr. F. H. Claridge, a graduate of Sheffield Scientific School and the Yale Forest School was secured and took charge of this work September 1, 1925. An area west of Pullen Park was loaned by the State College farm to the Department for starting a nursery and water was secured from the College main not far away. Seeds were sown during the fall of 1925 and the spring of 1926. It is expected that some 75,000 seedlings of loblolly, longleaf, shortleaf, and slash pine will be ready for distribution during the spring of 1927. Under the conditions of the Federal coöperation these trees will be distributed to farmers only at a price approximating the cost of production.

The seeds of the various pines were found to be so extremely hard to secure and so expensive that steps were taken to collect seeds in this State. This is an industry which has not as yet been developed but which promises suitable remuneration for intelligent local residents who can collect the cones from the felled trees on nearby sawmill operations. The Department is encouraging this line of work with the idea of not only supplying its own needs but developing an industry which has elsewhere brought in considerable revenue to those who can handle the work intelligently.

In addition to the distribution of seedlings some small amount of seed of slash pine has been distributed for experimental sowing. The results from this type of reforestation have not been very successful. Some coöperative experiments in the growing of redwood seedlings were also started with private parties in 1925 but no seedlings either raised here or brought from California survived the exceptionally dry summer.

Highway Planting—While this Department has from time to time been called upon for advice and supervision in the planting of shade and ornamental trees along our highways by organizations and individuals it has been consistently recommended that this be made a feature of the State Highway Commission's work. The law gives that Commission full authority over the right-of-way and it only can control the reservation of trees occurring naturally and the planting and protection of those which are not found there.

In the development of the State policy and practice of forest planting it seems essential that the forest nurseries be established on land which is under the full and permanent control of the State Forest Service. Tree seedlings because of reduced growth or fluctuating demand often have to be carried over from one year to the next or yet sufficient land must be available for the next crop, while the high fertilization and specialized use makes long-time tenure a vital necessity. It is hoped that early provision will be made to take care of this.

General Forestry—The general work of the Division of Forestry outside of the special work of forest protection, forest planting, and administration of forest parks, consists in the gathering and giving out of information relating to the forest resources and forest industries of the State together with such administrative matters as coöperation with other organizations interested in conservation such as Federal and state departments and associations of private individuals. This has been one of the main features of this Department since the establishment of the Geological Survey in 1891. It is only through such contact with the people of the State that progress in conservation can be secured.

Examinations of private tracts of woodland are made not only to help the owner in the management of his property but also to establish if possible a demonstration which may affect the woodland policy of nearby owners. Examinations have been made by the State Forester of the lands of Hugh MacRae in Brunswick and Columbus counties; the woodlands of Dr. Wesley Taylor in Guilford County; the farm woodlands of J. T. Rogers in Durham County and of the State Prison

farm in Wake County. During the spring of 1926 the State Forester made a study of the forest conditions of Moore County with the object of assisting the County Board of Conservation and Development in laying out plans for the better utilization of the county's forests. Some results of this study have already been published.

The officials of the Department have endeavored to keep up with the progress of forestry in other parts of the country through attendance at conferences and meetings of associations. The State Forester has also coöperated closely with such associations and with the State and Federal Departments of Forestry. As Chairman of the Legislative Committee of the North Carolina Forestry Association he and one or more of his assistants helped to get up and carry through the program for the annual meetings of that Association. At the annual meeting in Asheville in July, 1925, Governor McLean added his strength to the forestry movement by making the keynote speech of the occasion in which he advocated larger appropriations and stronger organization for the protection of the forests of the State. As president of the Southern Forestry Congress the State Forester attended the annual meeting of that body in Little Rock, Ark., January, 1925, and as a member of the Executive Committee, he, together with the Director and two other members of the Department, took part on the program of the annual meeting in Richmond, Va., January, 1926. He is also a member of the Appalachian Forest Research Council which held its first meeting in Asheville in February, 1925, and attended the second annual meeting in January, 1926. This Council is appointed by the U. S. Secretary of Agriculture and is an Advisory Board to the Appalachian Forest Experiment Station. The work of this station in North Carolina has already been of service to the State in securing forestry information. With the recent increase in appropriation, secured largely through the efforts of Senator Overman, its usefulness will be greatly increased.

Coöperation with the various branches of the U. S. Forest Service, both financial and personal, affects almost every branch of the State work. Without the Federal aid which has been freely given much less progress would have been made. Coöperation with the State College previously referred to, includes the conduct of a two-term course in forestry given by the Assistant Forester of this Department.

The effective distribution of forestry information has taken a great deal of the thought and attention of the officials of this Division. Lectures and talks have been given as the opportunities occurred. The State Forester has lectured at the Eastern Carolina Teachers' Train-

ing College; Wake Forest College Summer School; the Centennial School, Raleigh; the Wilson Women's Club; North Carolina College for Women Botany Club; Carolina Lumber Dealers Association, Greensboro; the National Conference on State Parks, Skyland, Va., and at the Camp Councilors Conference, Tuxedo, N. C. The other technical members of the staff have also assisted in this line of work.

In order to reach the public with the forestry message, exhibits are made at the State Fair, and at many of the district and county fairs. Among others exhibits were made at the Made-in-Carolinas Exposition, Charlotte; Tri-State Fair, Spruce Pine; State Fair, 1924-1925, the Negro State Fair, 1924-1925 and the Eastern Carolina Exposition, 1925 and 1926.

A continuous stream of correspondence, replies to which often require careful thought and sometimes considerable investigation, occupies a large part of the time of the State Forester. An average of 100 to 150 letters per month are in this way attended to. More than half of these need personal replies. In addition articles are written for and interviews given the newspapers; while articles and reports are prepared for publication by the Department. The following publications have been issued during the period: Economic Paper No. 56, "Chestnut and Chestnut Blight In North Carolina," April, 1925; Circular 12, "An Advanced Program of Reforestation for North Carolina," Circular 13, "A Conservation Policy for North Carolina," Circular 14, "Possibilities and Advantages of State Forests," leaflets giving the forestry laws and instruction to forest wardens.

Since the removal of the office from Chapel Hill in September, 1924, the books, reports and pamphlets have accumulated more rapidly than it has been possible to index and arrange them. While forestry publications from other states and other countries are received as exchanges, reference to them is difficult because no complete files have been made. The need for an orderly arrangement of all publications dealing with conservation is very keenly felt. There is no library in Raleigh and probably none in the State where up-to-date information on the conservation of natural resources such as is needed by the members of the General Assembly and the various State Departments can be gathered. Office quarters sufficiently commodious to properly house the growing Department and to provide a special room as a conservation library with a competent person in charge to catalogue the books and arrange the files should be provided. The work of the Department would thus be greatly facilitated and much valuable information made available.

State Forests and Parks—This Department was authorized by the General Assembly of 1915 to acquire through gift or purchase land for “experimental, demonstration, educational, park and protection purposes.” That same body appropriated \$20,000 for the purchase of the land which now forms Mt. Mitchell State Park. Through executive action and later by action of the Legislature the care of this park was placed with this Department. Funds for its protection from fire have been secured largely through coöperation with the Federal Government.

During the fall of 1925 a steel tower was erected on the summit of Mt. Mitchell, which is the central peak of the park, but before it was entirely finished a heavy sleet storm coupled with defective construction caused its collapse in January, 1925. Since this was to be used as a lookout tower to assist in the location of fires in the district the coöperative forest protection fund had been drawn upon for its construction and therefore stood its share of the loss. Through the generosity of Col. C. J. Harris, of Dillsboro, a rough stone tower has been promised to replace the steel structure, and steps have already been taken to complete the building during the summer of 1926.

In 1924 application was made by E. A. Wilson and others to construct a motor road from Stepps Gap through the park to the summit of Mt. Mitchell. A bill was introduced in the 1925 Legislature authorizing E. A. Wilson to construct this road through the park without giving sufficient State control. This bill, however, was withdrawn and permits were granted by the Department for the construction of this road to penetrate only part way to the peak and to go through as short a distance of spruce forest as possible. This road was constructed in 1925 and was used to some extent during the summer of 1926. It is still uncompleted but when in good shape will through coöperation with the Mt. Mitchell Motor Road Company be connected with their road so that through travel may finally be extended from Black Mountain to Burnsville.

Through coöperation with the National Forest Administration a bridle trail is now opened from Stepps Gap along the western boundary of the park through Deep Gap and on to Micaville, a railroad point in Yancey County.

The park warden, Mr. D. L. Moser who has resided on the park almost continuously since the beginning of administration in 1916, resigned and gave up his work in December, 1924. Mr. Moser was intensely interested in the protection and improvement of the park and enjoyed the solitary life. He protected the park from fire through the dangerous period while logging operations continued upon and sur-

rounding it, and was remarkably successful in keeping fire out of the forest-covered areas. His place was taken by L. E. Wilson in March, 1925; by W. P. Wilson in June, 1925, and by W. H. Simmons, the present warden, in October, 1925.

Since nearly 1,000 acres or 85 per cent of the present area of the park has been cut over and a large part of it burned over, actual planting will be necessary to bring back the original spruce and balsam forest. A few seed beds have been established on the park and some experimental planting has been done. There was planting in the spring of 1925 but in 1926 several acres were planted. The native trees, red spruce and southern balsam, have so far been found best adapted to this site and it is planned to start a constructive program of planting so that the whole area of the park may within a reasonable time be reforested.

Fort Macon State Park—The General Assembly of 1925 accepted the gift of Fort Macon Military Reservation from Congress and placed it with this Department for administration. The following July the Acting Director of this Department, Major Wm. D. Harris arranged an opening celebration which with the assistance of Governor McLean, who spoke on that occasion, was successfully carried out. In November of that year the disposition of the small hunting lodge which had been constructed by some citizens of New Bern under Federal lease came up and a two-year lease was granted them with the understanding that the State would take over all such improvements at the end of the two-year period. These improvements consist of a small house, a driven well, and a rather insecure dock.

A dipping vat was constructed on the slopes of the Fort through action of the Federal tick eradication agents without the knowledge or consent of the Department. This structure has not yet been removed but its use has been discontinued. By special request of the State Veterinarian it is being held for a time for possible emergency use.

Through an arrangement with Capt. H. D. Goodwin, the men of the Coast Guard Station have taken general oversight of the property until a special park warden can be employed.

Rendezvous Mountain—In January, 1926, Judge T. B. Finley of North Wilkesboro offered to give to the State for administration by this Department a tract of land including Rendezvous Mountain to be maintained partly as an historic spot on which the Daughters of the American Revolution may establish monuments to the heroes of the Revolution. The remainder of the area is to be used for experiments

and demonstrations in forestry. Plans are now under way looking to the transfer of this gift, the first of its kind to the State. There is great need for such demonstration forests in other parts of the State.

State Lakes—By action of the General Assembly the lakes belonging to the State in Columbus and Bladen counties were placed for administration in this Department. Being without funds for this purpose little definite work has been accomplished. The State Forester has established contact with local parties interested in the use and development of these lakes and a policy regarding them is being formulated. It is planned to regulate recreation only so far as is necessary to insure the best permanent use of the lakes for the public and to prevent the destruction of the attractive features such as fish, game, forests, bathing places, etc. The private uses of the lakes, such as the construction of docks and boat houses will be continued under a permit system. This has already been inaugurated in Lake Waccamaw where five-year renewable permits are now being issued for nominal fees.

Through the efforts of the local representatives in the General Assembly of 1925 an appropriation of \$3,000 was secured to be matched by a similar amount from county or local sources for the construction of a dam across the outlet of Lake Waccamaw. The State Treasurer arranged with the Acting Director of this Department to supervise the work and approve the bills which were to be paid from the joint fund. The summer of 1925 found the lake three feet below normal exposing a large area of lake bottom along which it was possible to drive a car to the outlet into Waccamaw River. The dam was constructed during this period of low water under the immediate supervision of Mr. K. B. Council, Chairman of the Board of County Commissioners and K. Clyde Council who was a member of the commissioners authorized to undertake this work by the Federal authorities. The dam was completed during the following winter at a total cost of \$3,899.87. This left an unexpended balance of the State appropriation amounting to \$1,050.07 which was returned to the State treasury at the request of the local officials. A fish way was provided in order to comply with Federal regulations. At the end of the report period June, 1926, the lake had filled up to normal height and the dam was holding satisfactorily.

As soon as possible it is planned to give the fish in this lake better protection through regulations by the Fisheries Commission and by the employment of a warden during the fishing season.

It is felt that the acquisition of sufficient land, including part of the shore line of the lake, is necessary to insure the permanent use of the lake by the public. An appropriation to purchase such an area or to secure it through partial gift is most desirable.

The State lakes in Bladen County include White Lake, Singletary Lake, Black Lake, Jones Lake and possibly some others. None of these have been surveyed so that the State is unaware of the private claims which may be made upon them. Such a survey is of first importance and it is hoped that the next General Assembly will provide sufficient funds to complete this work which is preliminary to placing them under effective administration.

WATER RESOURCES DIVISION*

It is desired to state in this report not only what has been done during the biennium, but also to point out wherein we have failed and to indicate those fields of service in which this Division of Water Resources believes it should function for the economic advancement of the State.

Water resources, unlike coal and other minerals, are fluid in character. They cannot be saved by hoarding; they cannot be possessed by any man as private property for his future use for water cannot be contained. It is only the right to use water that can be acquired, and it is in the manner of this use that the State should be and is vitally interested. It has been recently said by Herbert Hoover, "True conservation of water is not the prevention of use. Every drop of water that runs to the sea without yielding its full commercial returns to the nation is an economic loss, and that loss in all its economic implications can be computed in billions."

As the Chief Hydraulic Engineer pointed out in a previous report, true conservation of these resources can be attained, only, by maximum judicious use, secured through the correlation of their several uses in such a manner as to realize their maximum utility. It is to enable North Carolina to realize this maximum benefit and financial return from her water resources that this Division functions.

It is generally agreed that the highest uses of water resources are:

- (a) For source of supply for water-works serving the public for domestic and municipal purposes.
- (b) For purposes of sanitation by the conveyance of sewage and industrial wastes after suitable treatment, when and where needed.
- (c) For water for manufacturing and industrial purposes, for development of power, for agriculture and for navigation.

The use or uses for which any particular stream or body of water lying within a drainage area should be reserved, depends partly on the economic activities of the people living therein; the physical characteristics of the country through which the stream flows, and the prevailing climatological conditions. Hence the problem of conserving our water resources through judicious development has been and will continue to be three-fold in nature. It is necessary to determine not only what prevailing economic conditions dictate as the purposes a particular water resource can best serve, but also, the characteristics with which the stream has been endowed by nature; and then by engineering processes, to bring it under the control of man for the realization of that benefit.

*Established in Chapel Hill in 1920.

The first two steps in the subjection of these fluid resources are governmental functions; the third is in the realm of private operations except where the use is of a municipal nature. North Carolina has not, as yet, awakened entirely to a consciousness of the need for the rational utilization of her streams, but a large part of the activities of this Division are related to the second necessary step, namely, the determination of the natural characteristics of her surface streams.

Stream gaging, or the collection of stream flow data, has constituted our major activity and there follows a number of tables in which the extent of these operations is indicated. In this work, we have coöperated with the United States Geological Survey's Water Resources Division through their district office at Asheville, and all of the field work has been done by their highly expert men* according to standardized methods in national use.

Table I on page 34 shows the distribution of gages according to the co-operating party or parties.

At the time of the establishment of the Water Resources Division in 1920, 12 stations were being maintained by the U. S. Geological Survey. With our coöperation, this number increased to 22 in 1921; 24 in 1922; 28 in 1923; 38 in 1924, and 49 in 1925; with a final total of 54 on June 30, 1926. Of the stations now in operation, about fifteen are equipped with automatic recording gages, the others being ordinary staff or chain gage stations.

Table II on page 35 shows the coöperative funds used in stream gaging work on North Carolina streams on a quarterly basis.

In this table, it will be noticed that the army engineers engaged in the Tennessee River Survey have been aiding in stream gaging since the second quarter of 1925. It is expected that their coöperation will be extended through June 30, 1928 at which time their present appropriation will be expended. Also, that considerable coöperation has been given by municipalities. In this connection, it should be said that a great deal more of coöperative money could be secured from various agencies for installation purposes if sufficient funds could be made available by the State† or Federal agency for carrying the overhead

*This report should not be allowed to go to press without making special mention of the splendid work performed in North Carolina by Mr. E. D. Burchard who has been in charge of the District Office of the U. S. Geological Survey since August 1, 1924.

†The recent action of the N. C. Section of the American Water Works Association should be noted in connection with stream gaging. At their August meeting in Wilmington their committee on Stream Flow and Forestation rendered a report which was unanimously adopted and of which 1,000 copies have subsequently been printed. This report suggested legislative appropriations to the Department of Conservation and Development as follows: \$20,000 annually for stream gaging work over a period of years; \$10,000 during the next biennium for a survey of the underground waters of the coastal plain section; and \$5,000 for the establishment and maintenance of a tree nursery in the western part of the State.

costs of operation. Under the present conditions, the burden of additional coöperative stations cannot be assumed. As evidence of this fact, it will be noted in Table I that no new stations have been established during 1926, but that instead, fifteen were discontinued on September 30.

In connection with stream gaging, it should be stated that heretofore, this work has necessarily been confined to the larger streams with power possibilities. As a result, the power needs for stream flow data have been materially served and it is the smaller watershed which is demanding attention. The industrial development which followed in the wake of abundant power has introduced problems which can only be economically solved through the intelligent use of comprehensive stream flow data. Reference is being made to the need of our fast-growing municipalities for adequate supplies of water, and streams for the absorption of industrial and domestic wastes.

Recent failures in a number of municipal supplies are pointed to, not as a result of incorrect engineering judgment, but as instances where the best engineering judgment available, permitted inadequate system designs because the fundamental data concerning the type of stream under consideration was not available. With reference to sewage purification plants and stream pollution, it is stated by the State Board of Health, that they will be seriously handicapped in the discharge of their duties unless we can place additional stream flow information at their disposal. For many of the streams in which they are concerned, there is not so much as a single discharge measurement. An expanded stream gaging program is the only answer.

Stream Gaging Activities In Other States—Table III shows the status of stream gaging in a number of representative states over a period of years. Of the states listed, the column under "Total State to Date," shows that North Carolina is outranked by all except Virginia and Tennessee in this activity. North Carolina is spending about \$8,000 annually with a total of \$35,840 to date while California is spending about \$25,000 annually with \$458,000 to date as her total. The amount of stream flow data available in the two states is on a somewhat comparable basis.

TABLE I
REPORT OF GAGING STATIONS AND COOPERATING PARTIES BY QUARTERS

Quarter Ending	Army Engineers	Weather Bureau	Municipal Cooperation	Private Persons	State Cooperation	Counted More than Once	Maintained at end of Month	Established During Quarter
September 30, 1924	0	0	2	6	35	8	35	1
December 31, 1924	0	1	1	6	38	8	38	4
March 31, 1925	0	1	2	7	40	10	40	1
June 30, 1925	0	1	4	9	44	44	44	5
September 30, 1925	16	1	4	10	47	31	47	4
December 31, 1925	16	1	7	10	49	34	49	5
March 31, 1926	16	1	7	10	49	34	55	6
June 30, 1926	16	1	12	9	54	38	54	0
September 30, 1926	16	1	12	9	54	38	39 †	0
December 31, 1926	14	0	11	8	39	33	39	0

Army Engineers Cooperation—part of Tennessee River Survey work.
 †Fifteen stations discontinued this date—insufficient funds. Total of 22 discontinued during period.
 ‡Total of 419 discharge measurements made (regular), with numerous miscellaneous measurements.
 NOTE.—All of this work was done in cooperation with the U. S. Geological Survey under supervision of District Engineer.

TABLE II
STATEMENT OF COOPERATIVE FUNDS USED IN STREAM GAGING WORK IN NORTH CAROLINA

	1925						1926					
	Quarter Ending:											
	March 31	June 30	September 30	December 31	March 31	June 30	September 30	December 31	March 31	June 30	September 30	
State.....	\$ 2,892.47	\$ 3,021.01	\$ 1,601.02	\$ 1,413.57	\$ 1,351.89	\$ 1,281.64	\$ 1,281.64	\$ 1,413.57	\$ 1,351.89	\$ 1,281.64	\$ 1,370.33	
U. S. G. S.*—Asheville.....	735.18	219.22	1,101.15	1,913.38	1,401.51	1,206.81	1,206.81	1,913.38	1,401.51	1,206.81	1,522.51	
U. S. G. S.*—Tennessee.....	0.00	0.00	0.00	134.70	40.36	64.59	64.59	134.70	40.36	64.59	0.00	
Army Engineering*.....	0.00	231.00	231.00	227.17	230.00	231.00	231.00	227.17	230.00	231.00	231.00	
Power Company*.....	84.41	88.10	65.37	15.00	30.00	84.46	84.46	15.00	30.00	84.46	10.00	
Municipal.....	0.00	29.18	104.47	773.70	0.00	773.57	773.57	773.70	0.00	773.57	0.00	
Others.....	0.00	880.00	0.00	15.00	0.00	58.34	58.34	15.00	0.00	58.34	89.68	
Total Other Than U. S. G. S.....	2,987.08	4,249.29	2,086.96	2,594.14	1,633.25	2,493.60	2,493.60	2,594.14	1,633.25	2,493.60	984.25	
Total Other Than State.....	820.54	1,447.50	1,591.99	3,080.95	1,701.87	2,428.77	2,428.77	3,080.95	1,701.87	2,428.77	1,853.19	
Grand Total.....	\$ 3,713.21	\$ 4,468.51	\$ 3,193.01	\$ 4,494.52	\$ 3,054.76	\$ 3,700.41	\$ 3,700.41	\$ 4,494.52	\$ 3,054.76	\$ 3,700.41	\$ 2,346.73	

*These funds handled directly through U. S. G. S. office at Asheville.

NOTE:—All of the stream gaging work in N. C. is handled cooperatively either through the U. S. G. S. office in Asheville or the Water Resources office in Chapel Hill.

TABLE III
COMPARATIVE FIGURES ON DISTRIBUTION OF STREAM GAGING ACTIVITIES*

State	1924		1925		1926		Total State to Date
	Federal	State	Federal	State	Federal	State	
North Carolina.....	\$ 4,000	\$ 5,920	\$ 3,600	\$ 9,693	\$ 3,375	\$ 8,038	\$ 35,870
Virginia.....	2,500	-----	2,500	4,138	-----	15,000	15,466
Tennessee.....	2,500	4,683	2,900	3,880	2,600	12,000	28,169
New Jersey.....	3,000	9,355	2,900	11,090	-----	19,179	73,917
New York.....	5,500	11,080	4,500	15,490	-----	17,000	223,088
Ohio.....	3,000	24,865	2,900	26,133	-----	88,484	-----
Texas.....	5,000	62,990	4,300	72,238	-----	36,325	263,340
Missouri.....	4,000	8,775	3,600	9,290	-----	9,927	46,863
Wisconsin.....	3,500	6,250	3,250	6,160	-----	6,154	84,574
California.....	5,500	22,580	4,500	21,535	-----	35,098	450,545
Maine.....	-----	5,107	-----	5,278	-----	5,107	91,565

*From U. S. G. S. Reports.

Note:—Tennessee received \$16,500 from Army Engineer sources in 1926 and has received funds from the same source the previous two years.

Other Activities—During this biennium, there has not been a single person permanently employed on a full-time basis with the exception of the field engineer and special clerk-stenographer of the stream-gaging personnel. However, many investigations and studies have been undertaken. Water power surveys have been carried out in Stokes County on the Dan River, and in Ashe and Watauga counties on the New and Watauga rivers in coöperation with the mentioned counties. Ashe County alone contributed \$2,000 for meeting the expenses of field parties. In each case the county was to bear the field expenses and the Division the expense of office work incurred in rendering a report.

Among other routine investigations, quality of water in surface streams (chemical analysis), flood flows, meteorological conditions, rainfall, evaporation and silting in reservoirs, should be mentioned. In all of these undertakings, coöperation has been established with some agency.

It is pertinent at this point to cite the coöperation in progress with the city of Durham as an example of how the Division and a municipality can coöperate to their mutual benefit and to the benefit of all who are concerned in the utilization of water resources. In connection with the development of Flat River as a source of supply for Durham, Lake Michie, a reservoir of approximately four and a half billion gallons capacity has been created by the construction of an 80-foot dam.

Through the recommendations of the consulting engineer, W. M. Piatt of Durham, \$2,000 was appropriated by the city for the use of the Division in establishing gaging stations, evaporation pans and other meteorological stations. In addition, twenty concrete monuments were placed at ten measured cross sections to allow the Division to undertake silt studies. A great deal of work of this nature could be undertaken by the Division if adequate funds were provided by the State for the maintenance of a suitable personnel which would result in the collection of much valuable data. Then, too, it should be stated that it is our duty to undertake such investigations and make their yield available for the use of the public. This is so because natural phenomena must be studied over long periods of years; records of unbroken continuity and undoubted accuracy established, with all contributory factors faithfully noted to prevent misinterpretation. Manifestly, such information cannot be acquired by private organizations who are subjected to the vicissitudes of changing industrial conditions.

Besides the above mentioned investigations, this Division has been called on to make several special investigations and to render reports thereon.

In 1925, the Hydraulic Engineer prepared a report on the "Flood Flows of the Cape Fear River System," at the request of the State Highway Commission. Early in 1926, he rendered a report in conjunction with the State Geologist on the "Water Supply for Caswell Training School" which is a State institution. From March until the middle of July in 1926, he and the assistant engineer of the Division were concerned in an investigation of sources of water supply for the State Hospital at Morganton. In connection with this, the assistant engineer spent approximately a month in Morganton acting under instructions from Governor Angus McLean. At the request of J. S. Holmes, State Forester, a trip of inspection was made to Lake Waccamaw and a report was rendered on the failure of its dam.

Mention should be made of Resolution 48 of the General Laws of 1925, instructing us to undertake a survey in the vicinity of Roanoke Island for the purpose of determining the feasibility of opening certain inlets. As no funds were provided for this purpose, the survey was not undertaken, but a reconuissance of the region was made by the assistant engineer in company with State Senator-elect, E. S. Askew of Merry Hill. It was recommended that the survey be referred back to the Legislature and that not less than \$5,000 be appropriated for the purpose of making a preliminary examination of the region if it should still be desired.

The publications of this Division listed under the Division of Publications, have been in wide demand and have been frequently reprinted or referred to by the technical press. However, mention should be made of the fact that considerable statistical work involving compilations and calculations requiring technical expertness of a high order, is necessary in their preparation.

Relations With the Federal Power Commission—The Division has continued to coöperate with the Federal agency in their relation to power developments in the State, and the executive secretary of the Commission, Mr. O. C. Merrill has been extremely courteous in keeping the Division posted as to applications for either preliminary permits or licenses. The Hydraulic Engineer has attended the various public hearings, and in general has kept closely in touch with all developments in which the State was in any way concerned.

In pursuing the various activities mentioned in this report, the following disbursements have been made:

	1924-25	1925-26	Total
Personal Services.....	\$ 12,505.48	\$ 8,469.66	\$ 20,975.14
Supplies and Materials.....	129.64	395.10	524.74
Postage, Telephone and Express.....	265.48	368.83	633.81
Travel Expenses.....	1,440.76	1,628.35	3,069.11
Printing, Binding and Publicity.....	172.00	138.80	310.80
Light and Gas.....			
Repairs.....	4.50	22.25	26.75
General Expense.....	1,272.55	637.24	1,909.79
Equipment.....	168.85	1,267.50	1,436.35
Auto Upkeep.....	382.10	1,091.67	1,473.77
Total.....	16,341.36	14,018.90	30,360.26

Economic conditions in the State demand the expansion of certain of the Division's activities, principally among them being stream gaging; and the addition of several others. In particular, it is suggested that the Division should undertake a thorough study of our coasts and begin the collection of certain fundamental field data which will be greatly needed within a few years as a result of the extensive development of certain sections, and the present impossibility of development in others due to conditions which can be remedied.

The estimated cost of the minimum program of recommended work* for the coming biennial period is as follows:

	1927-28	1928-29	Total
Personal Service	\$19,235.00	\$20,635.00	\$39,870.00
Supplies and Materials	450.00	550.00	1,000.00
Postage, Telephone and Express	465.00	515.00	980.00
Travel	5,000.00	5,000.00	10,000.00
Printing, Binding and Publicity	1,900.00	2,200.00	4,100.00
Motor Vehicle Upkeep	1,245.00	1,705.00	2,950.00
General Expenses	1,020.00	920.00	1,940.00
Equipment	3,950.00	2,950.00	6,900.00
Total Estimated Expenditures.....	\$33,265.00	\$34,475.00	\$67,740.00
Less Cooperation Expected.....	3,955.00	4,395.00	8,350.00
Total Request From State Appropriations	\$29,310.00	\$30,080.00	\$59,390.00

1. Bulletin 34: Discharge Records of North Carolina Streams, 1889-1923. Published January, 1925.
2. Circular 10: The Power Situation In North Carolina, 1924. Published in latter part of 1924.
3. Accomplishments and Future of Water Resources Division. Published in mimeograph form in January, 1926.
4. Circular 16: Power Situation In North Carolina, 1925. Ready for distribution December 15, 1926.

*This budget as originally recommended, contained several items not included herein, among them being a survey of the underground waters of the coastal plain section.

GEOLOGY AND MINING

The Division of Mineral Resources has continued the work of collecting and indexing statistics of the State's mineral production and has examined and reported on 331 mineral specimens sent to it. Answers to inquiries in regard to the minerals and mineral prospects have been given.

In addition to the above routine service, special investigations and reports of unusual interest were made as follows:

Dr. J. L. Stuckey, State Geologist, made an examination of the stone and clay along the Bonlee and Western Railroad between Bennett and Bonlee. No clay of promise was found but stone in abundance, suitable for all sorts of crushed stone and for general building purposes, such as modern homes and schools, was found.

He also made an examination of the geological formations of Wilkes County. It led to the conclusion that there is a belt of pegmatite dikes and granites in which, by careful prospecting, good feldspar, mica and kaolin can be found.

The State Geologist also made a short survey of the marble deposits of Cherokee County, the result of which reveals an immense deposit of marble, both white and gray-blue, which can be used for tombstones, building stone, and crushed stone. The high calcium variety can be used for lime purposes.

A large deposit of building stone, as igneous slate, rhyolite and tuff, which is to be quarried and used in the buildings of the Greater Duke University building program, has been located by the Geologist. The locating of this one deposit will save Duke University several hundred thousand dollars in freight as it is very close to the proposed building site.

A very complete survey of the clays along the Seaboard Air Line Railway from Monroe was made by Dr. J. L. Stuckey in company with Dr. Calhoun, Geologist for the Seaboard. It is one of the best and most complete of any surveys of clays of the pre-Cambrian and Triassic periods.

The State Geologist, with Dr. Greaves-Walker of State College, made a general survey of the shales and clays of the Piedmont section of this State. This work was done to determine the possibilities of that section in the ceramic industry. The summary of this survey has been published under the title of "The Development of the Ceramic Industries In North Carolina," in the January, 1926, number of "The Ceramist."

The State Geologist made a very complete survey of the feldspar and kaolin deposits in North Carolina. North Carolina has held an important position in these industries for several years. A more complete survey is needed in certain sections that he did not visit.

About the most important work accomplished in the past few years by the Department of Geology was the general geological survey and general geological map of Moore County. A preliminary report has been prepared on the county and a more detailed report is now being made. As a direct result of this survey, several industries, especially clay, are being located in this county. The report covers the coal, brick clay, tale or pyrophyllite, and sand and gravel possibilities of the county.

Mr. W. H. Butt was employed to keep a record of the log from the oil-prospect well at Havelock and after his resignation Mr. W. C. Mansfield, of the U. S. Geological Survey, continued the work. This work was in coöperation with the United States Geological Survey. Mr. Mansfield's report is now ready and will be published in a short while. He is also to furnish this Department with a duplicate set of the well samples which will be valuable in the proposed underground water survey.

Economic Paper No. 55, "The Mineral Industry of North Carolina, 1918 to 1923, Inclusive," was prepared by Brent S. Drane, Director, and Dr. J. L. Stuckey, State Geologist, under the former North Carolina Geological and Economic Survey. This report was the result of a thorough field study by Dr. Stuckey. The value of mineral production in North Carolina more than doubled during that period.

Expenditures during the period of this report have been as follows:

Geologists' salaries	\$5,567.83
Traveling expenses	1,037.72
General expenses	1,032.19
Microscope and accessories	350.00
Total	<hr/> \$7,987.74

An appropriation for a survey of the underground water resources of North Carolina by the Division of Water Resources in coöperation with the Division of Mineral Resources has been proposed. Such a survey is needed because individuals and towns inquire from this Department for information in regard to the kind of subterranean water they may tap while boring a deep well. At present, to answer such inquiries it is a matter of more or less guess work based on experiences of those who have bored in that particular vicinity or locality.

A mineral report for the years 1924 and 1925 is being compiled and will be ready for the press in the early part of 1927. Such reports are valuable for those who are interested in the mining industry of the State.

At present there is no geological map of North Carolina available for distribution. With the increasing interest in the mining industry of the State, many requests are made for such a map. An appropriation should be made to publish one that could be distributed to those who desire one. Dr. Wm. F. Prouty, of the Department of Geology, University of North Carolina, has completed an excellent map which would be of great value.

A total of \$12,615.00 is the estimate of total needs for the coming biennial period and reported to the Budget Commission.

FINANCIAL STATEMENT

RECEIPTS AND DISBURSEMENTS OF THE NORTH CAROLINA DEPARTMENT OF CON-
SERVATION AND DEVELOPMENT FOR THE FISCAL BIENNium FROM
JULY 1, 1924 TO JUNE 30, 1926

Receipts

Balance on hand July 1, 1926.....	\$ 3,965.50
Received from State Treasurer.....	111,150.00
From Forestry Cooperation:	
Federal—Fire Prevention	\$54,981.11
Nursery	986.98
County	19,675.60
Private—Fire Prevention	2,003.57
Nursery	1,000.00
	78,647.26
Water Resources:	
Private	4,683.83
Geological:	
Private	535.67
Expositions	2,279.57
Interest on daily bank balances.....	99.85
Sale of Publications.....	827.19
Refunds—fire fighting and other expenses.....	2,602.48
Rent of privileges—Mount Mitchell.....	236.58
Miscellaneous	1,566.96
	Total
	\$206,594.89

Disbursements

Administrative Division.....	\$ 39,887.47
Forestry Division (including State Parks).....	126,841.83
Water Resources	30,360.26
Geological	7,987.74
	205,077.30
	Balance June 30 1926.....
	\$ 1,517.59

LIST OF PUBLICATIONS

NATURAL RESOURCES, a bi-weekly publication, devoted to information about and discussion relating to the conservation and development of the State's natural resources and their place in the life of the people, is mailed free upon application. Its contents are available, for use in the press or otherwise, with or without credit or acknowledgment.

There have been printed and are on hand for distribution at the prices noted a number of publications—bulletins, economic papers, volumes, reports, circulars—covering a wide variety of subjects and special studies, as follows:

MINES AND MINERALS

Bulletin 2. Building and Ornamental Stones in North Carolina, by T. L. Watson and F. B. Laney in collaboration with George P. Merrill, 1906. 8°, 283 pp., 32 pl., 2 figs. *25 cents. Cloth-bound copy 50 cents.*

Bulletin 11. Corundum and the Bastic Magnesian Rocks of Western North Carolina, by J. Volney Lewis, 1895. 8°, 107 pp., 6 pl. *5 cents.*

Bulletin 13. Clay Deposits and Clay Industries in North Carolina, by Heinrich Ries, 1897. 8°, 157 pp., 12 pl. *10 cents.*

Bulletin 19. The Tin Deposits of the Carolinas, by Joseph Hyde Pratt and Douglas B. Sterrett, 1905. 8°, 64 pp., 8 figs. *4 cents.*

Bulletin 21. The Gold Hill Mining District of North Carolina, by Francis Baker Laney, 1910. 8°, 137 pp., 23 pl., 5 figs. *15 cents. Cloth-bound copies 75 cents.*

Bulletin 22. A Report on the Cid Mining District, Davidson County, N. C., by J. E. Pogue, Jr., 1911. 8°, 144 pp., 22 pl., 5 figs. *15 cents. Cloth-bound 75 cents.*

Bulletin 25. Zicon, Monazite and Other Minerals Used in the Production of Chemical Compounds Employed in the Manufacture of Lighting Apparatus, by Joseph Hyde Pratt, Ph.D., 1916. 8°, 120 pp., 3 pl. *15 cents. Cloth-bound copies 75 cents.*

Bulletin 28. Limestones and Marls of North Carolina, by G. F. Loughlin, E. W. Berry, and J. A. Cushman. Prepared by the North Carolina Geological and Economic Survey in coöperation with the United States Geological Survey, 1921. 8°, 211 pp., 7 pl., 3 figs. *15 cents.*

Bulletin 29. The Kaolins of North Carolina, by W. S. Bayley, prepared in coöperation with the United States Geological Survey. *50 cents.*

Bulletin 31. Deposits of Brown Iron Ores (Brown Hematite) in Western North Carolina, by W. S. Bayley. *50 cents.*

Bulletin 32. Magnetic Iron Ores of Western North Carolina and Eastern Tennessee, by W. S. Bayley. *15 cents.*

Bulletin 33. The Deep River Coal Field of North Carolina, by Marius R. Campbell and Kent K. Kimball. Prepared in coöperation with United States Geological Survey. *10 cents.*

Economic Paper 15. The Mining Industry in North Carolina During 1907, by Joseph Hyde Pratt, 1908. 8°, 176 pp., 13 pl., and 4 figs. *15 cents.*

Economic Paper 23. The Mining Industry in North Carolina During 1908, '09, and '10, by Joseph Hyde Pratt and Miss H. M. Berry, 1911. 8°, 134 pp., 1 pl., 27 figs. *10 cents. Cloth-bound copies 50 cents.*

Economic Paper 34. The Mining Industry in North Carolina during 1911-1912, by Joseph Hyde Pratt, State Geologist, 1914. 8°, 63 pp., 23 pl., 12 figs. *15 cents.*

Economic Paper 49. The Mining Industry in North Carolina During 1913-1917, Inclusive, by Joseph Hyde Pratt, State Geologist, and Miss H. M. Berry, Secretary, 1919. 8°, 170 pp. *20 cents.*

Economic Paper 55. The Mineral Industry in North Carolina, 1918-1923, Inclusive, by Brent S. Drane, Director, and Jasper L. Stuckey, Geologist, 1925. 8°, 104 pp. *25 cents.*

EXAMINATION OF MINERAL SPECIMENS

Samples of any mineral found in the State may be sent to the Department of Conservation and Development, Raleigh, N. C., for identification, and the same will be classified free of charge. It must be understood, however, that NO ASSAYS OR QUANTITATIVE DETERMINATION WILL BE MADE. Samples should be in lump form, if possible, and marked plainly on outside of package with name of sender, postoffice address, etc.: a *letter* should accompany sample and *stamp* should be enclosed for reply.

FORESTS, FIRE PREVENTION

Bulletin 5. The Forests, Forest Lands, and Forest Products of Eastern North Carolina, by W. W. Ashe, 1894. 8°, 128 pp., 5 pl. *5 cents.*

Bulletin 7. Forest Fires; Their Destructive Work, Causes and Prevention, by W. W. Ashe, 1895. 8°, 66 pp., 1 pl. *5 cents.*

Bulletin 16. Shade Trees of North Carolina, by W. W. Ashe, 1908. 8°, 74 pp., 10 pl., 16 figs. *5 cents.*

Bulletin 17. Terracing of Farm Lands, by W. W. Ashe, 1908. 8°, 38 pp., 6 pl., 2 figs. *4 cents.*

Bulletin 23. Forest Conditions in Western North Carolina, by J. S. Holmes, 1911. 8°, 116 pp., 8 pl. *15 cents.*

Bulletin 24. Loblolly or North Carolina Pine, by W. W. Ashe, Forest Inspector, U. S. Forest Service (and former Forester of North Carolina Geological and Economic Survey). Prepared in coöperation with the Forest Service, U. S. Department of Agriculture, 1914. 8°, 176 pp., 27 pl., 5 figs. *15 cents. Cloth 75 cents.*

Bulletin 30. Wood-using Industries of North Carolina, by R. K. Helphinstine, Jr., 1923. Prepared in coöperation with the U. S. Forest Service. *15 cents.*

Economic Paper 1. The Maple Sugar Industry in Western North Carolina, by W. W. Ashe, 1897. 8°, 34 pp. *2 cents.*

Economic Paper 19. Forest Fires in North Carolina During 1909, by J. S. Holmes, Forester, 1910. 8°, 52 pp., 9 pl. *5 cents.*

Economic Paper 20. Wood-using Industries of North Carolina, by Roger E. Simmons, under the direction of J. S. Holmes and H. S. Sackett, 1910. 8°, 74 pp., 6 pl. *10 cents.*

Economic Paper 25. Proceedings of Second Annual Convention of the North Carolina Forestry Association, held at Raleigh, N. C., February 21, 1912. Forest Fires in North Carolina During 1911. Suggested Forestry Legislation. Compiled by J. S. Holmes, Forester, 1912. 8°, 71 pp. *5 cents.*

Economic Paper 33. Forest Fires in North Carolina During 1912 and National and Association Coöperative Fire Control, by J. S. Holmes, Forester, 1913. 8°, 63 pp. *5 cents.*

Economic Paper 37. Forest Fires in North Carolina During 1913 and a Summary of State Forest Fire Prevention in the United States, by J. S. Holmes, Forester, 1914. 8°, 82 pp. *8 cents.*

Economic Paper 40. Forest Fires in North Carolina During 1914 and Forestry Laws of North Carolina, by J. S. Holmes, State Forester, 1915. 8°, 55 pp. *5 cents.*

Economic Paper 42. Organization of Coöperative Forest Fire Protective Areas in North Carolina, being the Proceedings of the Special Conference on Forest Fire Protection, held as part of the Conference on Forestry and Nature Study, Montreat, N. C., July 8, 1915. Prepared by J. S. Holmes, State Forester, 1915. 8°, 39 pp. *4 cents.*

Economic Paper 46. The Vegetation of Shackleford Bank, by I. F. Lewis, 1917. 8°, 40 pp., 11 pl. *10 cents.*

Economic Paper 48. Forest Fires in North Carolina During 1915, 1916 and 1917, and Present Status of Forest Fire Prevention in North Carolina, by J. S. Holmes, State Forester, 1918. 8°, 97 pp. *10 cents.*

Economic Paper 51. Forest Fires in North Carolina During 1918, 1919 and 1920, and Forest Protection in North Carolina, by J. S. Holmes, State Forester, 1921. 8°, 82 pp. *10 cents.*

Economic Paper 56. Chestnut and Chestnut Blight in North Carolina. *Price 15 cents.*

Economic Paper 57. The Economic Development of the Furniture Industry of the South and Its Furniture Dependence Upon Forestry, by C. F. Korstian. *Price 15 cents.*

Circular No. 1. The Forest Problem in North Carolina, by W. Darrow Clark, May 1922.

Circular No. 3. Forestry Problem of the Southern Appalachian and Southeastern States, by Joseph Hyde Pratt, 1922.

Circular No. 9. Federal Forest Purchases and Forest Recreation, by Verne Rhodes, 1924.

Circular No. 11. Forest Fires and Taxation, by K. E. Kimball, 1925.

Circular No. 12. An Advanced Program of Reforestation for North Carolina, by Hon. Angus Wilton McLean, Governor of North Carolina.

Circular No. 13. A Conservation Policy for North Carolina, by J. S. Holmes, State Forester.

Circular No. 14. Possibilities and Advantages of State Forests, by E. A. Sherman.

Circular No. 15. Forest Tree Planting, by F. H. Claridge.

WATER-POWER RESOURCES

Bulletin 8. Water Power in North Carolina, by George F. Swain, Joseph A. Holmes, and E. W. Meyers, 1899. *16 cents.*

Bulletin 20. Water Powers of North Carolina. An appendix to Bulletin 8, 1910. *25 cents.*

Bulletin 34. Discharge Records of North Carolina Streams from 1889 to 1923, by Thorndike Saville and G. Wallace Smith. *Paper-bound copies \$1.50; cloth-bound copies \$2.00.*

Economic Paper 54. Water Power Investigation of Deep River, by Thorndike Saville. *Price 25 cents.*

Circular 6. The Water Power Situation in North Carolina, by Thorndike Saville, 1923. (This circular contains the same information as Circular No. 2, brought up to date.)

Circular 10. The Water Power Situation in North Carolina, by Thorndike Saville, 1924.

DRAINAGE

Economic Paper 38. Forms Covering the Organization of Drainage Districts Under the North Carolina Drainage Law, chapter 442, Public Laws of 1909, and Amendments. Forms for Minutes of Boards of Drainage Commissioners Covering the Organization of the Board up to and Including the Issuing of the Drainage Bonds. Compiled by George R. Boyd, Drainage Engineer. *25 cents.*

Circular 4. Drainage Assessments: Their Imposition and Their Collection Under the North Carolina Drainage Law, by Frank Nash, Assistant Attorney-General, August, 1922.

Circular 8. North Carolina Drainage Law. (Consolidated Statutes of 1919, with citations of Supreme Court Opinions, and Amendments to date). Prepared by the North Carolina Geological and Economic Survey, 1923.

FISHERIES AND SEA PRODUCTS

Economic Paper 12. Investigations Relative to the Shad Fisheries of North Carolina, by John N. Cobb, 1906. *6 cents.*

Economic Paper 15. Experiments in Oyster Culture in Pamlico Sound, North Carolina, by Robert E. Coker, 1907. *10 cents.*

Economic Paper 16. Report of Convention Called by Governor R. B. Glenn to Investigate the Fishing Industries in North Carolina. Compiled by Joseph Hyde Pratt, State Geologist, 1908. *5 cents.*

Economic Paper 24. Fishing Industry of North Carolina, by Joseph Hyde Pratt, 1911. *5 cents.*

Economic Paper 29. Report of Fisheries Convention Held at New Bern, N. C., December 13, 1911. Compiled by Joseph Hyde Pratt, State Geologist, together with a Compendium of the stenographic notes of the meetings held on the two trips taken by the Legislative Fish Committee appointed by the General Assembly of 1909, and the legislation recommended by this Committee, 1912. *15 cents.*

Vol. II. Fishes of North Carolina, by H. M. Smith, 1907. *Cloth-bound copies \$2.50.*

GEOLOGY AND PALEONTOLOGY

Bulletin 18. Bibliography of North Carolina Geology, Mineralogy and Geography, with a list of maps by Francis Baker Laney and Katherine Hill Wood, 1909. *Cloth-bound \$1.00.*

Vol. I. Corundum and the Basic Magnesian Rocks in Western North Carolina, by Joseph Hyde Pratt and J. Volney Lewis, 1905. *35 cents. Cloth copies \$1.50.*

Vol. V. The Cretaceous Formations of North Carolina, 1923. *50 cents. Cloth-bound copies, \$1.75.*

Part 1. Invertebrates of the Upper Cretaceous Formations, by Lloyd William Stephenson.

Vol. III. The Coastal Plain Deposits of North Carolina, by William Bullock Clark, Benjamin L. Miller, L. W. Stephenson, B. L. Johnson and Horatio N. Parker, 1912.

Pt. 1. The physiography and geology of the Coastal Plain of North Carolina, by Wm. Bullock Clark, Benjamin L. Miller, and L. W. Stephenson. *25 cents.*

Pt. 2. The Water Resources of the Coastal Plain of North Carolina, by W. L. Stephenson and B. L. Johnson. *25 cents.*

GEOLOGY AND TOPOGRAPHY

Map of North Carolina; scale 1-500,000; unmounted. *75 cents.*

Map of North Carolina; scale 1-500,000; mounted on cloth *\$1.50.*

Map of Beaufort County; scale 1-40,000; colored paper. *25 cents.*

Map of Franklin County; scale 1-40,000; colored paper. *25 cents.*

Map of Surry County; blue and white paper. *25 cents.*

Map of Virginia District; colored paper; geological. *25 cents.*

Bulletin 27. The Altitudes of North Carolina, 1917. *20 cents.*



